swarm had issued, and proceeded directly to the one which had just settled, and instantly united with them. The author is led from these and other facts to conclude that such unions of swarms are generally, if not always, the result of previous concert and arrangement.

The author proceeds to mention some circumstances which induce him to believe that sex is not given to the eggs of birds, or to the spawn of fishes or insects, at any very early period of their growth. Female ducks, kept apart from any male bird till the period of laying eggs approached, when a musk drake was put into company with them, produced a numerous offspring, six out of seven of which proved to be males.

The mule fishes found in many rivers where the common trout abounds, and where a solitary salmon is present, are uniformly of the male sex; hence the spawn must have been without sex at the time it was deposited by the female.

The author states that he has also met with analogous circumstances in the vegetable world, respecting the sexes of the blossoms of monoecious plants. When the heat is excessive, compared with the quantity of light which the plant receives, only male flowers appear; but if the light be in excess, female flowers alone are produced.

On the Laws of the Deviation of Magnetized Needles towards Iron. *By* Samuel Hunter Christie, *Esq. M.A. F.R.S. &c.* Read June 5, 1828. [*Phil. Trans.* 1828, *p.* 325.]

The author had pointed out, several years ago, the law of deviation of a magnetized needle, (either freely suspended or constrained to move in any particular plane,) from its natural position, by the influence of masses of iron in its vicinity. This law was founded on the hypothesis that the iron *attracted* both the poles of the needle: the position of which, resulting from this action, might be determined by that of an imaginary minute magnetic needle, freely suspended by its centre of gravity, reduced to the plane of revolution. The author had considered this law as fully established from its accordance with experiment; but Mr. Barlow, in a paper which was published in the last volume of the Philosophical Transactions, denies that such an accordance exists, and infers, from the results of some experiments which he made on horizontal needles, having their magnetism unequally distributed in their two branches, that the theory on which the preceding law is founded is fallacious. In opposition to the views of Mr. Barlow, the author contends that the phenomena observed are precisely those which must result from the theory he had himself adopted; and that they tend in no way to support the hypothesis of their being simply the effects of the magnetic power which the iron receives by induction from the earth.

The author was also led to suspect the accuracy of another conclusion which had been drawn by Mr. Barlow, namely, that the

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length of the needle had no sensible influence upon the extent of its deviations. In order to determine this point, he began by ascertaining more scrupulously than had yet been done, the values of several of the elements of the calculation, such as the exact positions of the points where the intensity of the magnetism is the greatest, and also of the point of neutrality, or of the magnetic centre; and he next subjected to a more severe scrutiny a law which had been regarded as established by experiment; namely, that the tangent of the deviation is proportional to the rectangle of the cosine of the longitude, into the sine of the double latitude of the position of the centre of the needle, with relation to the mass of iron as referred to a hollow sphere.

In the course of his experiments the author ascertained that if any bar of steel, uniformly magnetized by the method of double touch, have this state of magnetism disturbed by drawing the end of a magnet from its centre to the end, having the same polarity as that applied to it, then the pole at that end will be shifted towards the centre, while the opposite pole will be removed further from it, and a corresponding change will occur in the position of the magnetic centre. Changes will also take place in the absolute intensities of the magnetism at each pole. Considerable differences were observed in the extent of the deviations of a needle six inches in length, and of one of two inches long, when successively placed in the same position with relation to the shell of iron. At the distance of 16·8 inches they amounted to more than two degrees and a half; and the difference continued to be very sensible even at a distance of 24 inches from the shell. In general when the needles were near to the north or south of the centre of the shell, the deviations of the longer needle exceeded those of the shorter; and the reverse took place when the needles were placed on the east and west sides. Hence he concludes that the efficacy of a small mass of iron placed near to the needle to serve as a compensation to the effects of more distant masses, will depend upon its being itself at such a distance from the needle as that the difference of its action upon a long and a short needle shall be insensible.

The author proceeds to deduce from the law which he has proposed various forms of equations for determining the deviations of a horizontal-needle due to the action of an iron sphere or shell applicable to different circumstances and conditions of the case. In one set of equations, actions and resulting positions are referred to three rectangular co-ordinates proceeding from the centre of the needle; and in another set they are referred to polar co-ordinates relative to the vertical and to the plane of the horizon. He next deduces equations for computing the deviations of a needle in which the magnetism has been disturbed by applying to one of its poles the corresponding pole of a magnet. He then proceeds to the detail of experiments for investigating the above-mentioned laws, and to their comparison with the results deduced from theory. These experiments appear to him to establish, beyond all doubt, the influence which the length of a needle has on its deviations, produced by the attraction of the shell of iron. When examined by the test of the formulæ given by the author, the law of the tangent of the deviation being proportional to the rectangle of the cosine of the longitude into the sine of the double latitude on which so much dependance had been placed, is found to give results so inconsistent with one another, that it cannot be considered as even affording an approximation to the truth, and must therefore be wholly rejected.

The close agreement which the author found between the observed and the computed deviations of needles, whose magnetism had been disturbed by contact with a magnet, as well as those which had suffered no disturbance, fully confirmed the author in the views which he originally took of the action of iron on magnetized needles. He conceives that his hypothesis, instead of being at variance with observation, is not only consistent with all the experiments that have been made, but by affording the proper corrections to be applied to them, derives the strongest support from these observations.

He concludes by mentioning a fact which he conceives to be irreconcileable with the hypothesis of induced magnetism; namely, that a steel bar, rendered as hard as it was possible to make it, produced, when its ends are reversed, precisely the same effect on the needle as a bar of the softest iron under similar circumstances.

Description of a Sounding Board in Attercliffe Church, invented by the Rev. John Blackburn, *Minister of Attercliffe-cum-Darnall, Sheffield.* Read June 5, 1828. [*Phil. Trans.* 1828, *p.* 361.]

The church at Attercliffe had long been remarkable for the difficulty and indistinctness with which a voice from the pulpit was heard. These defects have been completely remedied by the erection of a concave sounding-board, having the form resulting from half a revolution of one branch of a parabola on its axis. It is made of pine wood; its axis is inclined forwards to the plane of the floor, at an angle of about 10° or 15°; it is elevated so that the speaker's mouth may be in the focus; and a small curvilinear portion is removed on each side, so that the view of the preacher from the side galleries may not be intercepted. A curtain is suspended from the lower edge for about 18 inches on each side.

The effect of this sounding-board has been to increase the volume of sound to nearly five times what it was before; so that the voice is now audible, with perfect distinctness, even in the remotest parts of the church, and more especially in those places which are situated in the prolongation of the axis of the paraboloid. But the side galleries are also benefited; probably from the increase of the secondary vibrations in a lateral direction. Several experiments are related illustrative of these effects; among which, the most striking, was one in which a person placed so as to have one ear in the focus of the paraboloid, and the other towards another person speaking